

Innovative Development of Kernel-Based Reduced-Order Models for Predicting LCO Onset, Phase I

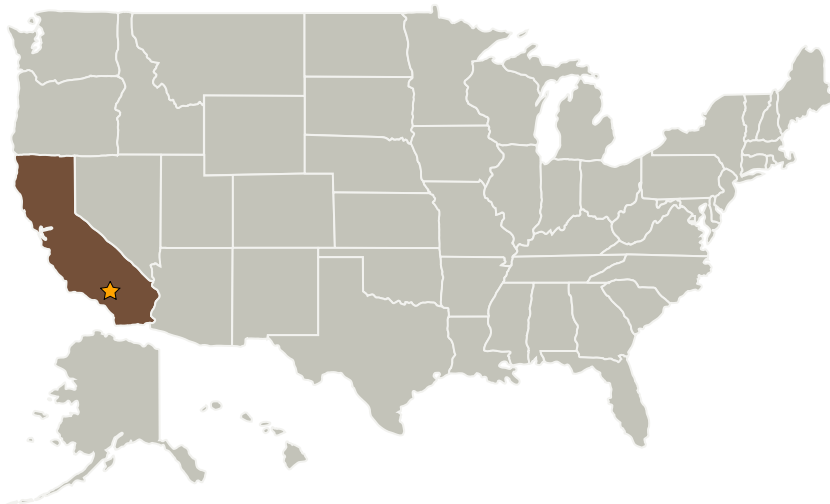
Completed Technology Project (2004 - 2004)



Project Introduction

Reducing uncertainty in the prediction of limit cycle oscillations (LCO) and other nonlinear aeroservoelastic phenomena is critical to flight safety. To do so requires nonlinear methods. First-principles based methods (CFD/CSD) have made considerable progress but still cannot predict LCO from the outset. NEAR proposes the development of two innovative nonlinear data-based methods to characterize aeroservoelastic systems using flight-test data. The proposed methods provide a natural extension of existing linear methods, provide uncertainty estimates of the prediction, and are applicable to flight-test data. Both approaches are formally related. However, their practical implementations place various limitations on the physics they represent. The Phase I effort will document, on a benchmark test case, the advantages and disadvantages of each method. Phase II will further develop the most promising approach and demonstrate its use on flight-test data, such as data from the F18-AAW. Special emphasis will be placed on the problem of data generalization across flight conditions, which is key to ensuring safe and efficient envelope-expansion flight testing.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
Nielsen Engineering & Research, Inc.	Supporting Organization	Industry	Santa Clara, California

Primary U.S. Work Locations

California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Patrick H Reisenhel

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.2 Flight Mechanics
 - └ TX15.2.2 Flight Performance and Analysis